

EXPLANATION OF PLATE XVIII.

Figs. 1-7. Structure of cuticle in the different species.
(Object-glass $\frac{1}{3}$ inch.)

Fig. 1. *Gordius fasciatus*, Baird.

Fig. 2. *Gordius fulgur*, Baird.

Fig. 3. *Gordius subbifurcus*, Meissner.

Fig. 4. *Gordius verrucosus*, Baird.

Fig. 5. *Gordius gratianopolensis*, Charv.

Fig. 6. *Gordius diblastus*, n. sp.

Fig. 7. *Gordius pachydermus*, n. sp.

XXXIII.—Notes on the Palæozoic Bivalved Entomostraca.
No. XII. Some Cambrian and Silurian Leperditia and Primitia*. By Prof. T. RUPERT JONES, F.R.S., F.G.S.

[Plates XIX. & XX.]

SINCE the publication of my notes on Scandinavian, British, and North-American *Leperditia*, in the Ann. & Mag. Nat. Hist. ser. 2, vol. xvii. pp. 81-100, ser. 3, vol. i. pp. 244-257, and pp. 340-342 (1856-58), considerable additions have been made to the list of known species, and to some extent a revision of the members of the group has been carried out. M. Fr. Schmidt† has given a careful monograph of the *Leperditia* of Russia and neighbouring countries; and Dr. Lars Kolmodin‡ has similarly treated those of his own country.

My esteemed friend M. J. Barrande has given us in his admirable 'Système Silurien du Centre de la Bohême'§, a perfect bibliographic history, as well of this genus as of some closely allied genera, as far as the date of his publication reaches; and, besides the descriptive details of the generic characters and an account of the new species discovered by himself in Bohemia, he has elaborated several most useful tables showing the geographical and geological range of the known forms of *Leperditia*, *Isochilina*, *Primitia*, and *Beyrichia*.

* For No. XI. see Ann. & Mag. Nat. Hist. ser. 4, 1875, vol. xv. p. 52.

† "Ueber die russischen silurischen Leperditien," &c., Mém. Acad. Imp. Sc. St. Pétersbourg, sér. 7, vol. xxi. (1873).

‡ 'Bidrag till Kämedomen om Sveriges Siluriska Ostracoder,' Upsala, 1869; and "Ostracoda Silurica Gotlandiæ," &c., Öfvers. Kongl. Vet.-Akad. Förhandl. 1879, no. 9 (Stockholm, 1880).

§ 1^e partie: Recherches paléontologiques. Supplément au vol. i. Tribolites, Crustacés divers, et Poissons. 4to, Paris and Prague, 1872.

Our fellow-workers in North America also have contributed to the geological history of these Ostracodes.

The gradual accumulation of specimens, and an improved acquaintance with their special characters, have enabled my colleagues, Dr. Holl, Mr. Kirkby, and Prof. Dr. G. S. Brady, and myself to offer at times some remarks on Palæozoic and other fossil bivalved Entomostraca; but, excepting as to the Carboniferous *Leperditia Okcni* and its varieties and allies, we have had little certain information to add to the general stock about this genus in particular. I have now, however, put together some notes and sketches illustrative of various doubtful points in the alliance of some British and other *Leperditiæ*, endeavouring to improve, if not simplify, their nomenclature. At the same time I have to introduce a few species not previously recognized.

In 1869 Dr. Lars Kolmodin* indicated the difference of form between certain specimens figured in the Ann. & Mag. Nat. Hist. 1856 (namely, pl. vi. figs. 1, 2, 4, and 5, on one hand, and fig. 3, *a-e*, on the other) as giving a varietal distinction; and in 1873 Fr. Schmidt† established a new species for Kolmodin's "var. *b*" (fig. 3, *a-e*, above mentioned) with the name of *L. Hisingeri*, illustrating also two varietal forms by his figs. 22 and 23. Subsequently‡ Dr. Kolmodin objected to this name, under an erroneous impression that it was the same as "*Cytherina Hisingeri*"§ as applied by Münster, and he substituted "*L. Schmidtii*."

There are certain differences between the more *oblong* carapaces of *L. balthica* (*l. c.* figs. 1, 2, 4, 5) and the more *ovate* form (fig. 3, *a-e*), as to both outline and relative convexity, the oblong form having the longest hinge-line, and being thickest at the anterior third, the other having a shorter hinge-line and being most convex in the middle.

In my paper of February 1856 (p. 86) I referred these distinctions to difference in age. The oblong form is rare. Large individuals are by no means common, I believe; and I have seen only one rather small specimen having this shape (in the British Museum), besides the two small valves shown by our figs. 10 and 11, and the imperfect valve shown by fig. 1 of our Plate XIX., which probably belongs to the form

* 'Sveriges Siluriska Ostracoder,' p. 14, figs. 4 and 5.

† Russ. silur. Leperd. p. 16.

‡ "Ostracod. Silur. Gotland." 1880; *Œfv. K. Vet.-Akad. Förh.* 1879, p. 133.

§ See Ann. & Mag. Nat. Hist. ser. 3, vol. xv. p. 408, pl. xx. figs. 12, *a-c*, where Jones and Kirkby defined Count Münster's Carboniferous species.

under notice. On the other hand, there are many small individuals of the subovate shape among specimens from Gothland. Taking every thing into consideration, I am inclined to think that the oblong specimens may be the *males* of the species. In aspect and structure the thick, smooth, brown carapaces of the two sorts (*oblong* and *ovate*) are remarkably similar. Nevertheless, for the convenience of collector and statist, as the difference of shape is easily recognized, it may be allowable to follow Fr. Schmidt in using the name *Hisingeri* for the ovate and *balthica* for the more oblong form, even if it has not a strictly specific claim.

Aiming at exact results, and trying to avoid unnecessary confusion in the endeavour to determine specifically either gradational forms or casts and damaged specimens (valuable on account of either rare occurrence or their geological position), I have taken pains in tabulating the measurements of my specimens; but the numerical value of relative dimensions has not given me precise grounds for classifying them, and I have had to rely more especially on the usually recognized features and characters.

Characteristic Features of the Leperditiadæ *.

1. Relative dimensions: absolute and proportional.
 - i. Length of valves.
 - ii. Length of hinge-line.
 - iii. Height of valves.
 - iv. Convexity of valves or thickness of carapace; often difficult to determine.

In comparing the *heights* of valves, it is to be remembered that the *right* is the overlapping and therefore the *higher* of the two valves.

2. Shape or outline.

All approach the oblong in outline, with one (upper or dorsal) margin straight for greater or less extent of hinging; but the *Leperditie* are subovate, with a more or less elliptical ventral curve.

- | | | | | |
|------|---------------------|----------------------------------|---|-------|
| i. | Approaching oblong, | with relatively long hinge-line. | | |
| ii. | ” | ovate, | ” | ” |
| iii. | ” | ” | ” | short |
| iv. | Obliquely | ” | ” | long |
| v. | ” | ” | ” | short |
| vi. | Cylindroid, | ” | ” | long |

* T. R. Jones, "Palæoz. Biv. Entom.," Geol. Assoc. Proceed. 1869, pp. 2 and 9; Monthly Microsc. Journal, Oct. 1, 1870, pp. 187 and 190.

3. Elevations and depressions of surface.

In *Leperditia*—

- i. Ocular tubercle and escutcheon.
- ii. Muscle-spot (and internal vascular markings).
- iii. Nuchal furrow.

4. Surface-ornament.

Reticulation, &c.

The subjects of the present paper have long been under observation, some for many years, and have been brought together, by the kind help of friends, from Siluria, Scandinavia, Livonia, Russia, and North America. The drawings have been made at different times and on various scales, some under a grant from the Royal Society, by the aid of which also the careful plates before us have been lithographed.

I believe that figs. 1, 10, 11, and 4 of Pl. XIX. belong to the typical (oblong) *L. balthica*, and that figs. 2, 3, 13, 14, and 17 represent a small and short variety of the same. Figs. 5, 6, and 16 are varieties of the more ovate *L. Hisingeri*, Schmidt. Such dwarfs and varieties of large well-marked forms remind us of the great variations to which the Carboniferous *L. Okeni* was subjected in the varying seas and lagoons of that period. Fig. 9 is a new species from N. W. Canada. Fig. 12 is *Isophilina punctata* (Eichw.); fig. 15, *L. phaseolus* (His.), var. In Pl. XX. figs. 1–3 are simple *Primitia* from Newfoundland; fig. 5 answers to the typical *L. canadensis*; and Pl. XIX. fig. 7, and Pl. XX. figs. 4, 7, and 8, are probably *L. fabulites* (Conrad). Pl. XIX. fig. 9 is *L. amygdalina* of Canada; and Pl. XX. fig. 6 is a fresh and correct drawing of *L. Hicksii*, one of the oldest species of the genus.

1. *Leperditia balthica* (Hisinger). (Pl. XIX. figs. 1, 4 a, 4 b, 10, 11 : all small specimens.)

1837. *Cytherina balthica*, His. Leth. Suec. p. 10, pl. i. fig. 2.

1854. *Cythere baltica*, Römer in Bronn's Lethæa Geogn. ii. p. 528 (parte), pl. ix³. figs. 8, 9.

1856. *Leperditia balthica*, Jones, Ann. & Mag. Nat. Hist. ser. 2, vol. xvii. p. 85 (parte), pl. vi. figs. 1, 2, 4, 5.

1869. *Leperditia balthica*, var. a, Kolmodin, Sveriges Siluriska Ostracoder, p. 14. figs. 1–3.

1873. *Leperditia balthica*, Schmidt, Mém. Acad. Imp. Sci. St. Pétersb. sér. 7, vol. xxi. no. 2, p. 15.

Pl. XIX. fig. 10. This is the outline of a small, suboblong, left* valve, somewhat broken at the hinder margin, $\frac{1}{10}$ inch

* The narrower and overlapped valve of the carapace.

in length, from the Upper Silurian of Wisby, Gothland. It was collected by Dr. G. Lindström, and is marked "No. 58689" in the British Museum.

In its sloping ventral border it is very close to fig. 23 in the plate illustrating Schmidt's memoir on the Silurian *Leperditia* of Russia, &c., which he regards as a long-backed variety of his *L. Hisingeri*; but in our fig. 10 the contour of the antero-ventral region is too full. Its great length of hinge-line is characteristic of the true *L. balthica*, of which species I take this to be a small individual, with the usual nearly level ventral line of the left valve.

Pl. XIX. figs. 11 *a*, 11 *b*. A rather larger and more convex valve (right), $\frac{11}{20}$ inch long, from the same place and collection (and numbered the same) as the last. In its greater ventral rotundity compared with that of its fellow (fig. 10), this specimen approaches Schmidt's subrotund variety of his *L. Hisingeri* (fig. 22, *loc. cit.*); but its postero-ventral curve falls short to some extent, and its hinge-line is too long. This specimen seems to me to be the right (larger) valve of a small *L. balthica*.

Pl. XIX. figs. 1 *a*, 1 *b*, show the hinder moiety of a damaged right valve from the Wenlock Limestone of the Wren's Nest, Dudley. It belonged to Mr. John Gray's collection, and is marked "No. 58892" in the British Museum.

This imperfect valve (probably $\frac{9}{10}$ inch long when perfect) has relatively a rather long hinge-line; and its nearly oblong outline is by no means sufficiently ovate to match Schmidt's fig. 23 before mentioned. It appears to be a small *L. balthica*, very narrow for a right (overlapping) valve.

In 1864 I saw in the Ludlow Museum a good cast of such an oblong *Leperditia* as the above described, $\frac{5}{8}$ inch in length. It was collected by Mr. Lightbody in the yellowish Downton Sandstone of the Upper Ludlow series, at Ludford Park, Old Leominster Road, near Ludlow.

Pl. XIX. figs. 4 *a*, 4 *b*. These outlines illustrate two specimens of left valves of different sizes, and more or less damaged by crushing, from a band of bluish-grey shale at the Hammond Hill cutting on the Bromyard and Worcester Railway, in Herefordshire. They were collected by Mr. George Reece, of the Worcester Museum; and the Rev. W. S. Symonds, F.G.S., who kindly communicated the specimens in 1877, states that this particular band "lies quite at the base of the Old Red, and is perhaps the equivalent of the grey bands in the passage-beds at Ledbury Tunnel, Herefordshire*, which contain the fishes *Auchenaspis Salteri* and *A. Egertoni*."

* See Quart. Journ. Geol. Soc. vol. xvi. p. 193, and vol. xvii. p. 152.

In the confused mass of casts and crushed valves, adherent in fragments, which compose the hand-specimen before us, it is difficult to find even a tolerably perfect outline, and real features are not easily determined. Fig. 4, *a*, however (a nearly perfect valve, $\frac{3}{20}$ inch long), shows a rather long hinge-line and oblong shape, like that of fig. 1, *a*, and of the large and oblong individuals of *L. balthica* (Ann. & Mag. Nat. Hist. *l. c.* pl. vi. figs. 1, 2, 4, and 5). On the other hand, fig. 4, *b*, a smaller valve, $\frac{1}{11}$ inch long, seems to have an ovate outline, approaching that of Schmidt's fig. 23, before alluded to. In this case small specimens of the two kinds (*oblong* and *ovate*) occur together; but still the latter is the smaller (younger?) of the two. These badly-preserved specimens may be dwarfs of *L. balthica*.

2. *Leperditia balthica* (His.), var. *contracta*, nov.
(Pl. XIX. figs. 2, 3, 13, 14, and 17.)

Pl. XIX. figs. 2 *a*, 2 *b*. This small specimen is from the same place and collection as fig. 1, and is marked "No. 58893" in the British Museum. It is $\frac{9}{20}$ inch in length, and is a broadly-ovate right valve, with a decidedly long dorsal edge; but it is well rounded ventrally, and convex at the centre. It altogether wants the oblique ellipticity of Schmidt's fig. 22 (var. of his *L. Hisingeri*) to be the same as that, and its hinge-line is too long; but at the same time it is too short and too much rounded ventrally for a true *L. balthica*.

This specimen approaches some forms of *L. canadensis*, such as fig. 11, *a*, pl. ix. Ann. & Mag. Nat. Hist. ser. 3, vol. i.; but it is larger and its convexity is central. Taking all its features into consideration, I must regard it as a small variety of *L. balthica*, to be distinguished under the name of var. *contracta*.

Casts of small *Leperditia*, from about $\frac{2}{10}$ to $\frac{3}{10}$ inch long, similar in shape to fig. 2 *a*, occur in the brown sandstone of the Kington Tilestones, Herefordshire (from Mr. R. W. Banks), and in the green shale of the Passage-beds near Ludlow (from Prof. John Morris), and with *Beyrichia Wilckensiana* in an olive-brown micaceous shale of the same series.

Pl. XIX. fig. 3. This is a brownish internal cast, in greenish fine-grained micaceous mudstone, of a small right valve, about $\frac{3}{10}$ inch long, somewhat crushed, from the Lower Ludlow beds at Leintwardine, near Ludlow*. It was collected by

* Mr. G. Cocking, of Ludlow, has found a similar specimen in the same beds at Church Hill, Leintwardine. In the 'Catalogue of the Fossils in the Museum of Practical Geology,' 1865, p. 38, a *Leperditia* is quoted as "*balthica*" from the Wenlock Limestone of Ferriter's Cove, Dingle, Ireland; but I have not yet examined the specimen.

Dr. H. B. Holl, F.G.S., and will be deposited in the British Museum.

This cast somewhat resembles in outline the *perfect valve*, fig. 2, *a*; but it has a relatively shorter hinge-line and a fuller antero-ventral curve, by which differences it approaches *L. Hisingeri*, without, however, identifying itself with that form. Although it has also some resemblance to *L. anticostiana* (fig. 8, *a*) in size and shape, this cast may belong to the same variety of *L. balthica* as fig. 2, namely var. *contracta*.

Pl. XIX. fig. 13. The outline of a small right (overlapping) valve, centrally convex, $\frac{3}{20}$ inch long. It is in the white Upper-Silurian *Pentamerus*-limestone of Talkof, Livonia, with *Primitia** and *Obolus* (?), and was communicated some years ago by the late M. d'Eichwald. This is very much like Schmidt's fig. 22, already referred to; but its postero-dorsal angle is more, and its front angle less, pronounced, thus making its main diameter (diagonal) less oblique than in that variety of *L. Hisingeri*, Schmidt, and giving an outline far more like that of our fig. 2 *a*, though still fuller on the ventral curve. Thus it seems to be a minute individual of *L. balthica*, var. *contracta*.

Pl. XIX. fig. 14. The imperfect outline of a partly-imbedded very small right valve, with eye-tubercle and muscle-spot. Length $\frac{3}{40}$ inch. In this minute specimen we have the long hinge-line of the large *L. balthica*, together with the typical dorsal angles fore and aft. In a dark-grey compact "*Pentamerus*-limestone" from Kamenetz-Podolsk, on the river Zbroutsch. Communicated by the late M. d'Eichwald, and labelled "*L. phaseolus*, His.;" but the shape is against this allocation. The limestone contains other small Entomostraca besides this dwarfish var. *contracta* of *L. balthica*.

Pl. XIX. fig. 17. This is a small left valve in grey limestone, also communicated by M. d'Eichwald, probably from the Baltic provinces; but the label has been lost. It measures $\frac{4}{10}$ inch in length, and has the contour of the long-backed oblong type of *L. balthica* as far as can be seen, its postero-ventral margin being still imbedded in the limestone. The ocular tubercle is visible; but the muscle-spot has been lost by fracture of the convex centre.

Fig. 17 much resembles the cast, fig. 3, but is larger, in the proportion of 8 : 6 in length, and has a more decided postero-dorsal angle. It agrees with *L. balthica*, var. *contracta*.

* Labelled "*Leperditia minuta*, Eichw.," and very near to *P. concinna*.

3. *Leperditia Hisingeri*, Schmidt.

(Pl. XIX. figs. 5, 6, 16: small and varieties.)

1837. *Cytherina balthica*, Hisinger, Leth. Suec. p. 10, pl. xxx. fig. 1.
 1854. *Cythere baltica*, Römer in Bronn's Leth. Geogn. ii. p. 528 (parte),
 pl. ix.³. fig. 8, a, b, c.
 1856. *Leperditia balthica*, Jones, Ann. & Mag. Nat. Hist. ser. 2,
 vol. xvii. p. 85 (parte), pl. vi. figs. 3, a-e.
 1858. *Leperditia marginata*, Schmidt, Untersuchungen &c. p. 192
 (parte).
 1860. *Leperditia baltica*, Eichwald, Leth. Rossica, p. 1329 (parte).
 1869. *Leperditia baltica*, var. b, Kolmodin, Sveriges Siluriska Ostracoder,
 p. 14, figs. 4, 5.
 1873. *Leperditia Hisingeri*, Schmidt, Mém. Acad. Imp. Sci. St. Pétersb.
 sér. 7, vol. xxi. no. 2, p. 16 (figs. 22, 23, var.).
 1880. *Leperditia Schmidtii*, Kolmodin, Öfversigt af Kongl. Vetenskaps-
 Akademiens Förhandlingar, 1879, no. 9, p. 133.

Pl. XIX. figs. 5 a, 5 b. This fragmentary but interesting relic (front moiety) of a small right valve was collected by the late H. A. Wyatt-Edgell, Esq., in the "Upper Llandovery Sandstone" of Eastnor, near Malvern. It is white, with the outer layer flaking off. When perfect it was probably about $\frac{9}{10}$ inch long.

As far as the imperfect contour allows of reconstruction, this seems to come nearest to Schmidt's *L. Hisingeri* of any of the British specimens that I have seen, being more ovate than any other, and with probably a short hinge-line. It shows the eye-spot, a slight nuchal furrow, and a trace of the muscle-spot. We may refer to it as a dwarfed individual *L. Hisingeri*, Schmidt.

Dr. Holl has collected an apparently similar *Leperditia* (as a cast) from the "May-Hill Sandstone" of Eastnor, which is the same formation.

A perfect carapace, about $\frac{1}{2}$ inch long, but unfortunately partly imbedded, of *Leperditia Hisingeri* (?), has been collected by Mr. G. F. Whidborne, F.G.S., in the Upper-Silurian Limestone of Colwall Copse, near Malvern.

Pl. XIX. figs. 6 a, 6 b, 6 c. This is a ferruginous internal cast of a small left valve, $\frac{3}{10}$ inch long, with short hinge-line, from the Tilestones (uppermost Silurian) of Kington, in Herefordshire. It was collected by Mr. Richard W. Banks, of that place.

In the outline, fig. 6, a, we see an approach to Fr. Schmidt's fig. 23, regarded by him as a varietal form of *Leperditia Hisingeri*; but the postero-dorsal slope in fig. 6, a, has a lower angle, giving a greater ellipticity to the region below. Our cast somewhat resembles also our fig. 10 at first glance; but its hinge-line is relatively shorter, and its front half has

less depth. We must remember that, as a cast, this specimen cannot be so good for such strict determination as either of the valves would be.

It exhibits the nearest approach among British specimens to Hisinger's *L. phaseolus** that I have met with; but still it does not correspond with it by any means in full, being much too short on the back and too elliptical behind. Moreover it more closely resembles in outline the valve of *L. amygdalina* from Canada (fig. 9, a); but its convexity is more central.

I prefer, therefore, to regard it as a small, narrow, and very oblique form (variety *gracilentata*) of *L. Hisingeri*, Schmidt.

To the same category we must relegate the imperfect specimen from Kington, figured in the Ann. & Mag. Nat. Hist. ser. 2, vol. xvii. pl. vii. fig. 15, and (with another cast) quoted as "*Leperditia marginata?*" at pp. 95 and 100. Both of these specimens, from the Downton Sandstone (Tilestones) of Herefordshire, are in the British Museum. For some similar casts in these light-brown micaceous sandstones †, and in the olive shales of the passage-beds near Ludlow, I have been indebted to the late Mr. J. W. Salter and Mr. Lightbody, of Ludlow. One specimen in the Ludlow Museum in 1864, from the passage-beds ("olive shales" or "Tinmill shales") in the railway-cutting at Ludlow, was $\frac{4}{8}$ inch long. Several smaller specimens were collected there by Mr. G. Cocking and the late Mr. Lightbody, together with *Eurypterus*, small Brachiopods, &c.

To this kind of *Leperditia* we must also refer those noticed by Mr. Salter in the 'Catalogue of the Collection of Cambrian and Silurian Fossils in the University Museum at Cambridge,' 1873, pp. 189 and 193, as "*L. marginata?*" from the Upper Silurian of Ledbury and Ludlow.

In the same Downton Sandstone (from Mr. R. Banks, of Kington) and in greenish micaceous shale (from Prof. J. Morris) of the uppermost Ludlow series I have had some casts of small *Leperditia*, from less than $\frac{2}{10}$ to $\frac{3}{10}$ inch long, that have the same outline as that shown in our fig. 2, a, as above mentioned.

Pl. XIX. fig. 16. This is the outline of a small left valve $\frac{5}{20}$ inch long, $\frac{3\frac{1}{2}}{20}$ inch high, and convex in the middle. It bears the structural marks of eye-spot and muscle-spot, and has a

* Carefully figured from the original type by Dr. Kolmodin in his 'Ostrac. Sil. Gotl.' 1880, pl. xix. figs. 4 and 5.

† With *Lingula* and *Beyrichia Wilckensiana*.

strongly inturned ventral border, fitted to receive the opposite overlapping edge. It exhibits the form of Schmidt's *L. Hisingeri*, having its short hinge-line and ovate outline, but is rather too full in the antero-ventral curve.

This specimen was given to me by the late M. d'Eichwald some years ago, and is from the Upper-Silurian coral-limestone of Randifer, Isle of Oesel. It was labelled "*L. phaseolus*, His."

Except that its hinge-line is rather shorter in proportion and its angles less acute, this minute form resembles in shape my fig. 3, *b*, pl. vi. Ann. & Mag. Nat. Hist. 1856. It has been somewhat cleared of its hard matrix since it came to me; hence its outline, as now visible, is broader than when it was labelled "*phaseolus*," and is more like that of *L. Hisingeri*, Schmidt, to which I refer it as a dwarf variety.

The localities in Scandinavia and Russia where *L. balthica*, *L. Hisingeri*, *L. phaseolus*, &c. occur may be gathered from the memoirs of Kolmodin and Schmidt, by whom the many references made by Hisinger, d'Eichwald, and others are corrected according to the revised nomenclature of the species. In the 'Neues Jahrbuch' for 1867, p. 592, some Lower-Silurian *Leperditia*-marls are mentioned which seem to be the same as the Russian "wayboards of greenish-grey or reddish shale" of Murchison's 'Siluria,' 1867, p. 356. In Scania, at Lake Ringshön, there are Silurian red sandy beds (overlying limestone) which contain small *Leperditia* similar to those from the Ludlow Passage-beds (*vide* E. Hébert, 1867).

4. *Leperditia phaseolus* (Hisinger), var. *marginata*. (Pl. XIX. fig. 15.)

Cytherina phaseolus, Hisinger, Anteckn. phys. &c. Heft 5, p. 110, pl. viii. fig. 3, Tableau, p. 2; Lethæa Suec. p. 9, pl. i. fig. 1 (*vide* Kolmodin). 1873. *Leperditia Angelini*, Schmidt (parte), Mém. Acad. Imp. Sci. St. Pétersb. sér. 7, vol. xxi. no. 2, p. 14, figs. 14 and 17 (*vide* Kolmodin). 1880. *Leperditia phaseolus*, Kolmodin, Öfv. K. Vetensk.-Akad. Förhandl. 1879, no. 9, p. 134, fig. 4, *a-e* (Hisinger's original specimen), and fig. 5, *a, b*.

Pl. XIX. fig. 15. This is an outline of a small right valve, with the usual ventral overlap and a high convexity along the middle, which cannot be shown in the outline. It is $\frac{1}{20}$ inch long, and has an extremely delicate reticulation on a smooth surface; and the spots of eye and muscle are visible. This valve has also a narrow but distinct flat rim on the anterior and posterior margins. It lies in a compact cream-coloured "calcaire à coraux," one of M. d'Eichwald's specimens from Randifer, Isle of Oesel, and it was labelled by him "*Leperditia phaseolus*, His."

Although this approaches figs. 10 and 11 in shape, it is longer in proportion; and though somewhat shorter relatively than Kolmodin's figures of *L. phaseolus* (from Hisinger's type specimen), it may really belong to that species. A Scandinavian true *L. phaseolus* (from Dr. Lindström) shows a somewhat granulated surface, which, when smoothed down, would give the slight reticulation above noticed; but it has no trace of the slight marginal flange existing in our Baltic specimen (not shown in the outline) on the front and hinder edges, like that seen in Schmidt's fig. 13, *a*, of his *L. Angelini*, and more developed than is shown in Kolmodin's fig. 5, *a*. This variable expression of a feature would scarcely alter the specific place of these specimens; and therefore I refer to this specimen from Oesel as *varietas marginata* of *Leperditia phaseolus* (Hisinger).

Fr. Schmidt's *L. Angelini* and its varieties (*op. cit.* pp. 13, 14, figs. 13-18) seem to comprise *L. phaseolus* (as both Schmidt and Kolmodin surmise) and some closely allied forms.

5, 6, and 7. *Leperditia canadensis*, Jones, and *Leperditia fabulites* (Conrad), with varieties; and *Leperditia amygdalina*, Jones.

The characteristic features of *Leperditia canadensis* and its varieties are described and illustrated in the *Ann. & Mag. Nat. Hist.* ser. 3, 1858, vol. i. pp. 244, 340, &c., pl. ix. figs. 11-17; and in the *Geol. Surv. Canada*, decade iii. 1858, pp. 92-95, pl. xi. figs. 6-12, 16, 17. Its stout little valves, with their subquadrate outlines and strong dorsal angles, are easily recognized, however much the variability in some respects affects the surface, margins, and contours. One set, however, of the varieties indicated in the above-mentioned memoir, namely that typified by var. *josephiana*, is somewhat distinct from the others, having the antero-ventral region much contracted, and therefore possessing a more elliptical and graceful outline than the others. It slightly approaches the shape of *L. phaseolus*, but would more closely represent an elliptical, elongate-ovate form of *L. balthica*, if this were taken as the leading type, than any modification of *L. Hisingeri*, Schmidt, which is characterized by a short hinge-line and a very deep and oblique postero-ventral region.

It is this form, moreover, that seems to have been Mr. Conrad's *Cytherina fabulites**, as intimated at page 341, *Ann. & Mag. Nat. Hist.* May 1858, and p. 95, decade iii. *Geol. Surv. Canada*, and further supported by Prof. Safford, of

* Philadelphia Acad. N. Sci. Proceed. 1843, vol. i. p. 332.

Tennessee, who wrote, in the winter of 1858, to Mr. Billings, then of the Canadian Geological Survey, at Montreal, as follows:—"The village in which I reside rests upon Trenton and Black-river rocks. Many of the layers abound in *Leperditia fabulites* (Conrad). Thousands of them can be seen in half-an-hour's walk. They are certainly Conrad's species, as Mr. Jones has suspected. Several years ago I compared specimens from Mineral Point, Wisconsin*. The average size is about that of fig. 16, plate xi. of the Decade, or perhaps a little smaller; but they occur of all sizes, from a third larger down to that of the figure of *L. amygdalina* (fig. 19, a), and even smaller."

Mr. Billings observed, in his letter of December 20, 1858 (containing the above quotation), that "Mineral Point is at no very great distance from St. Joseph's, and in the same run of rocks; so that we might expect to find the species there; but Tennessee is far from these localities. The geological position, however, is the same."

In view of adopting Conrad's prior name ("*fabulites*") for the common North-American *Leperditia* of the Lower-Silurian (Trenton) Limestone, we have to point out (as intimated above) that *Leperditia canadensis*, Jones, very variable in its individuals, can be grouped into two series: one set (I.) have a more subquadrate outline than the other (II.), which have a rather long hinge and an obliquely ovate body. There is another Lower-Silurian form (III.), typified by *L. amygdalina*, which has a short hinge-line and a very oblique ovate body.

I. *L. canadensis*, var. *nana*, Ann. & Mag. Nat. Hist. 1858, vol. i. p. 244, pl. ix. figs. 11, 12; Geol. Surv. Canada, decade iii. p. 92, pl. xi. figs. 6, 7, 9, 10 (this I take to be typical, though small); and var. *labrosa*, Ann. & Mag. Nat. Hist. l. c. p. 245; decade iii. p. 93, fig. 8: both from the Chazy Limestone.

For these I propose to keep the specific designation of *L. canadensis*.

II. Varieties—*josephiana*, Ann. & Mag. Nat. Hist. l. c. pp. 340, 341; decade iii. p. 94, fig. 16 ("*fabulites*," Conrad): *anticostiana*, Ann. & Mag. Nat. Hist. l. c. pp. 340, 341; dec. iii. p. 95, fig. 17: *louckiana*, Ann. & Mag. Nat. Hist. l. c. p. 245, pl. ix. fig. 16; dec. iii. p. 93, fig. 11: *pauquettriana*, Ann. & Mag. Nat. Hist. l. c. p. 246, pl. ix. fig. 17; dec. iii. p. 94, fig. 12.

* Mineral Point is mentioned in the 'Geology of Wisconsin; Surveys of 1873-7,' vol. ii. 1877, at p. 682 &c.; and *Leperditia fabulites* is referred to as abundant among the "Trenton" fossils, at pp. 294, 298, 300, 302, and 325.

For these it will be convenient to adopt *Leperditia fabulites* as the specific name.

III. *Leperditia amygdalina*, Ann. & Mag. Nat. Hist. l. c. p. 341; decade iii. p. 97, figs. 18, 19.

Of these *L. fabulites*, var. *josephiana*, is the largest, *L. amygdalina* is the next; and the others (varieties of *L. fabulites*) diminish in size in the order given above. *L. amygdalina*, from the Chazy Limestone, and *L. canadensis* (*nana*), from the Chazy Limestone and Calciferous Sandrock, are the oldest; *louckiana*, from the Bird's-eye Limestone, *josephiana* and *pauquettiana*, from the Trenton Limestone, and *anticostiana*, from the Hudson-River group, succeed in geological age. The closely allied *L. ovata* of Pennsylvania* is also from a Lower Silurian rock, namely the Black-River Limestone, next above the Bird's-eye Limestone. The more cylindrical form, *L. Billingsii*, sp. n., from near Lake Winnipeg, is, like some of the foregoing, from the Trenton Limestone.

Pl. XIX. figs. 7, 8, and 9 illustrate some Canadian specimens described in 1858 (Ann. & Mag. Nat. Hist. ser. 3, vol. i. pp. 340-342), but not figured at that time.

Fig. 9, a perfect carapace of *L. amygdalina*, from L'Orignal, Canada West, has a length of $\frac{17}{40}$ inch. This species varies somewhat in relative proportions among individuals, but keeps an elongate oblique ovate form and the forward position of its convexity.

Fig. 8, a perfect carapace of *L. fabulites* (Conrad), var. *anticostiana*, $\frac{19}{40}$ inch long, is rather shorter and higher, in proportion, than the smaller valve figured in the Canad. Surv. decade iii. Besides East Point other localities in Anticosti yield this *Leperditia*. In the 'Catalogue of Anticosti Fossils,' by W. Billings, 1866, at page 68 it is said to occur at the Jumpers and other places in "Divisions 3 and 4 of the Anticosti group."

Fig. 7, a perfect carapace of *L. fabulites* (Conrad), var. *josephiana*, $\frac{1}{2}$ inch long, from St. Joseph's Island, Lake Huron. The ventral margin sloping away from the front end, the well-rounded posterior margin, and the rather long hinge-line are features which bring this form near to the Scandinavian *L. phaseolus*; but the latter is subcylindrical, having rather less ventral depth and a convexity *along* the middle of the valves.

Pl. XX. fig. 7 is a right valve, in outline, of *L. fabulites*, var. *josephiana*, $\frac{11}{20}$ inch long. The specimen came from St. Joseph's Island, at the outlet of Lake Superior, and was given to me by Prof. James Hall in 1872.

* Ann. & Mag. Nat. Hist. ser. 3, vol. i. p. 252, pl. x. fig. 14.

Fig. 8 is a perfect carapace, in outline, of *L. fabulites*, var. *josephiana*, with a length of $\frac{7}{10}$ inch and a height of $\frac{4}{10}$ inch, from Lebanon, Tennessee, U.S., and was also given to me by Prof. J. Hall.

Pl. XX. figs. 4 and 5. The specimens here figured were selected from among many crushed individuals forming a piece of *Leperditia*-rock, labelled "Neile Bay," and communicated by E. B. Tawney, Esq., F.G.S., as a fragment of a larger mass in the Museum of University College, Bristol. If "Neile Bay" be the same as, or near to, Port Neill, in Prince-Regent's Inlet, in extreme North America, the occurrence there of such *Leperditie* as these, which have a Lower-Silurian aspect (being apparently identical with *L. canadensis* and *L. fabulites*), would not be strange.

Fig. 4 is the outline of a left valve, broken along the ventral margin, and about $\frac{1}{4}$ inch long. What remains of the valve indicates the proportions of *L. fabulites* (*josephiana*).

Fig. 5 is a left valve, apparently retaining its outline, but broken at the centre, where it shows another similar valve underneath, symmetrically squeezed within it. This specimen is about $\frac{1}{4}$ inch long, and has the subquadrate outline, long hinge, and sharp dorsal angles of the typical *L. canadensis*.

8. *Leperditia Billingsii*, sp. nov. (Pl. XX. fig. 9.)

This is the internal cast, in white limestone, of a subcylindrical carapace, and is not quite perfect at the dorsal corners or ends of the hinge-line. It is from the Lower-Silurian (Trenton?) strata, near (to the west of) Lake Winnipeg and north of Lake Superior. In length it is $\frac{5\frac{1}{2}}{20}$, and in height $\frac{3}{10}$ inch. This unique specimen was sent to me by the late W. Billings, Esq., then palaeontologist to the Geological Survey of Canada, in December 1858. In its cylindroid shape and in its relative length, height, and thickness this *Leperditia* differs from all the North-American species, and has too true a parallelism of the upper and lower margins to be compared with any allies of *L. phaseolus*. Nor has it any analogue except the less convex Upper-Silurian *L. parallela* of Schmidt's Russ. silur. Lep. 1873, p. 18, figs. 24-26, and the minute *L. parallela*, J. & K., of the Carboniferous rocks of Bavaria (Ann. & Mag. Nat. Hist. 1865, ser. 3, vol. xv. p. 407, pl. xx. fig. 6). I name it after its discoverer.

9. *Leperditia alta* (Conrad).

Among the Upper-Silurian *Leperditie* of North America

are two forms which have been called *L. alta* (Conrad). These were figured by Prof. James Hall in the 'Palæontology of New York,' 1852, and were described and figured by myself in the Ann. & Mag. Nat. Hist. 1856, ser. 2, vol. xvi. p. 88, pl. vii. figs. 6, 7; and 1858, ser. 3, vol. i. p. 250, pl. x. figs. 8, 9. Prof. Hall subsequently referred to these forms in the 'Palæontology of New York,' vol. iii. 1859, part i. p. 372, intimating that the larger of the two might be distinguished as *L. Jonesii*; but the illustrations were not published with the text. It seems to me, however, that these larger (higher) specimens should retain the specific name of "*alta*."

In the 'Report of the Geological Survey of Ohio,' part ii. Palæontology, 1873, p. 187, Prof. F. B. Meek redescribed *L. alta* (Conrad), and gave two outlines (pl. xvii. figs. 2, *a*, *b*), analogous to the earlier figures, of the broad and the narrow forms respectively. In this case, as in the others, the two shapes ought to be distinguished, fig. 2 *b* (like fig. 7, pl. vii. Ann. & Mag. Nat. Hist. 1856) being a representative of *L. phaseolus* (His.) of Scandinavia; whilst fig. 2 *a* (like fig. 6, *l. c.*) is a broad or higher form, deserving the name "*alta*."

10. *Leperditia Hicksii*, Jones. (Pl. XX. fig. 6.)

Leperditia Hicksii, Jones, Quart. Journ. Geol. Soc. 1872, vol. xxviii. p. 183, pl. v. fig. 16 (mala).

An incorrect figure (reversed and imperfect) of this Cambrian *Leperditia*, interesting on account of its rarity and age, having been given in the Quart. Journ. Geol. Soc. above referred to, the specimen is here redrawn. It is $\frac{1}{4}$ inch long and pyritous. It was found at St. David's, South Wales, in or about the zone of *Paradoxides Hicksii*, rather below the middle part of the Menevian group.

ISOCHILINA, Jones.

1858. Subgenus, Jones, Ann. & Mag. Nat. Hist. ser. 3, vol. i. p. 248.
 1870. Genus, Jones, Monthly Microsc. Journ. October 1870, pp. 187, 191.
 1872. Genus, Barrande, Syst. Silur. Bohême, part i, suppl. to vol. i. p. 533.
 1873. Genus, Schmidt, Mém. Acad. Imp. Sci. St. Pétersb. sér. 7, vol. xxi. no. 2, pp. 9, 21.

1. *Isochilina punctata* (Eichwald). (Pl. XIX. fig. 12.)

1856. *Leperditia marginata* (Kutorga), Jones, Ann. & Mag. Nat. Hist. ser. 2, vol. xvii. p. 91, pl. vii. figs. 11-13.
 1860. *Leperditia phaseolus*, var. *punctata*, Eichw.
 1873. *Isochilina punctata*, Schmidt, Russ. sil. Leperd. pp. 10, 22, figs. 36, 37.

Pl. XIX. fig. 12 exhibits the outlines of an impression (inside of a hollow cast) of the outside of the fore part of a left valve, which was probably $\frac{7}{10}$ inch long when perfect. It is in white Upper-Silurian Porambonite Limestone, from Gatschina, near Saretsche, in the Government of St. Petersburg. The rock is crowded with similar specimens, as convex and concave casts. It was sent to me (with other specimens) in 1862, by the late M. d'Eichwald, and is the same as the fragments of white Lower-Silurian Limestone with Entomostraca which I treated of in the Ann. & Mag. Nat. Hist. 1856. The figs. 11 and 12 of pl. vii. in that volume, and referred to at pp. 91 and 100, belong to this species, and not to *L. marginata** (Keyserling). I find that one, at least, of the specimens there concerned shows, under the microscope, casts of those minute pits on the marginal flange of the ventral border which originated d'Eichwald's "*L. phaseolus*, var. *punctata*," and Schmidt's "*Isochilina punctata*."

Fig. 12 is an enlarged drawing of the hollow impression of the antero-dorsal angle (with its eye-tubercle) of a left valve, similar to fig. 12, a, pl. vii. Ann. & Mag. Nat. Hist. *loc. cit.*, and belonging to *I. punctata*, Schmidt.

This species has its North-American representative in the Lower-Silurian *Isochilina gracilis*, Jones, of Canada (Ann. & Mag. Nat. Hist. 1858, ser. 3, vol. i. p. 248, pl. x. fig. 2; and Geol. Surv. Canada, decade iii. p. 98, pl. xi. fig. 15).

2. *Isochilina grandis* (Schrenck).

The large specimen from Rupert's Land, described and figured as "*Leperditia marginata*, Keyserling?" in the Ann. & Mag. Nat. Hist. ser. 2, 1856, vol. xvii. pp. 94 and 100, pl. vii. figs. 14, a-d, is an *Isochilina*. It differs materially from Keyserling's "*Cypridina marginata*," as pointed out by Dr. F. Schmidt in his memoir on Russian *Leperditia*, 1873, p. 19. It is related to *Isochilina formosa*, Barrande (Syst. Sil. Bohême, vol. i. suppl. 1872, p. 534, pl. xxiii. figs. 22-25, and pl. xxxiv. figs. 1-3), and to *Isochilina gigantea* (Römer), described and redrawn by M. Barrande, *op. cit.* p. 535, pl. xxxiv. figs. 4-6. It differs from both sets of figures in the slope of its antero-ventral region, its obliquely ovate body, and the more elliptical curve of its lower margin. It still more closely resembles, however, Schmidt's figures of Schrenck's "*Cypridina grandis*" (Russ. sil. Leperd. figs. 1, 3-6), to which species Schmidt refers Ferd. Römer's "*Leperditia gigantea*" above mentioned. This last is determined by M. Barrande to be an *Isochilina*; and although Dr.

* As pointed out by F. Schmidt, Russ. sil. Leperd. 1873, p. 22.

Schmidt regards it as a *Leperditia*, I think that the former is correct. Among Schmidt's figures of one cast and three valves there are sufficient variations to cover any slight differences that the one specimen from North America may exhibit, as compared with any one of those figures of the large Upper-Silurian form from Scandinavia.

PRIMITIA, Jones & Holl.

Primitia, Jones & Holl, 1865, Ann. & Mag. Nat. Hist. ser. 3, vol. xvi. p. 415, and 1868, ser. 4, vol. ii. p. 55 &c.; Jones, Pal. Biv. Entom. Proceed. Geol. Assoc. 1869, p. 8 &c.; Barrande, 1872, Syst. Sil. Bohême, vol. i. suppl. p. 539.

1. *Primitia simplex*, Jones, varr.

Pl. XX. figs. 1, 2, 3. These are simple *Primitiæ*, common in some pieces of limestone from the "Saint-John group" of St. John's, in Newfoundland, given to me in 1866 by the late Mr. T. G. B. Lloyd. This rock is referred to the "Lower Potsdam" ("Cambrian") by Prof. John Milne, F.G.S., in the Quart. Journ. Geol. Soc. vol. xxx. p. 743.

Figs. 1, *a*, *b*, are the outlines of a right valve, about $\frac{3}{10}$ inch long; figs. 2, *a-c*, of a complete carapace $\frac{2}{10}$ inch long; and fig. 3 is a drawing of a right valve, about $\frac{2\frac{1}{2}}{40}$ inch long. These valves differ but slightly among themselves in their shape, having a nearly semicircular ventral curve, with a broadly ovate outline of body and straight back. Figs. 1 and 2 have a relatively high convexity. Fig. 3 shows the most symmetrical ends; fig. 1 has the postero-dorsal slope more expressed; and fig. 2 has the hinge-line extended so far back that this slope is almost lost. Fig. 1 is like the Lower-Silurian *Primitia simplex*, Jones (Ann. & Mag. Nat. Hist. ser. 2, 1855, vol. xvi. p. 173, pl. vi. fig. 25; and ser. 3, vol. xvi. p. 417), of Portugal and Shropshire; but it shows no trace of a dorsal notch or furrow. Fig. 2 is also somewhat like *P. simplex*, and is even more comparable with *P. obsoleta*, Jones & Holl (Ann. & Mag. Nat. Hist. ser. 3, vol. xvi. p. 423, pl. xiii. fig. 12), from the Upper Silurian of Scandinavia; but it is more convex than the latter, and has not its marginal rim. Fig. 3 represents *P. simplex* in a general way; but, instead of a simple dorsal notch it has a slight curved, subspiral, comma-shaped elevation, due to a narrow semicircular depression on the convexity of the valve, and a small curved, tapering, concentric furrow within the other on the dorsal region.

Fig. 1. *P. simplex*, var. *Sanctojohannesiana*.

Fig. 2. ————, var. *Lloydiana*.

Fig. 3. ————, var. *Milneana*.

EXPLANATION OF THE PLATES.

(The specimens here figured, except figs. 7, 8, and 9 of Pl. XIX., either are or will be deposited in the British Museum.)

PLATE XIX.

- Fig. 1. *Leperditia balthica* (Hisinger), small individual, natural size. Upper Silurian; Wren's Nest, Dudley. *a*, lateral view; *b*, dorsal view.
- Fig. 2. *Leperditia balthica* (His.), var. *contracta*, nov., right valve, nat. size. Upper Silurian, Wren's Nest. *a*, lateral; *b*, ventral view.
- Fig. 3. *Leperditia balthica* (His.), var. *contracta*, nov., internal cast of a right valve (somewhat crushed), magnified 4 diam. From the Lower-Ludlow beds at Leintwardine, near Ludlow.
- Fig. 4. *Leperditia balthica* (His.): *a* and *b*, outlines of two specimens of left valves, of different sizes, and both more or less damaged, and 4 *b*, more ovate, probably in consequence; magnified 11 diam. Uppermost Silurian; from the Bromyard and Worcester railway.
- Fig. 5. *Leperditia Hisingeri* (?), Schmidt, small portion of a right valve, magnified 2 diam. From the Upper Llandovery of Eastnor, near Malvern. *a*, lateral; *b*, anterior view.
- Fig. 6. *Leperditia Hisingeri*, Schmidt, var. *gracilentata*, internal cast of a left valve, magnified 2 diam. Upper Silurian; Kington, Herefordshire. *a*, lateral; *b*, ventral; *c*, anterior view.
- Fig. 7. *Leperditia fabulites* (Conrad), var. *josephiana*, Jones, perfect carapace, with left valve exposed, nat. size. Lower Silurian; St. Joseph's Island, Canada. *a*, lateral; *b*, ventral view.
- Fig. 8. *Leperditia fabulites* (Conrad), var. *anticostiana*, Jones, perfect carapace, left valve exposed, nat. size. Lower Silurian; Anticosti, Canada. *a*, lateral; *b*, ventral view.
- Fig. 9. *Leperditia amygdalina*, Jones, perfect carapace; exposing left valve, nat. size. Lower Silurian; L'Orignal, Canada. *a*, lateral view; *b*, ventral edge of the left (overlapped) valve; *c*, ventral edge of the right (overlapping) valve.
- Fig. 10. *Leperditia balthica* (His.), small, left valve broken at the hinder margin, nat. size. Upper Silurian; from Wisby, Gothland.
- Fig. 11. *Leperditia balthica* (His.), small, right valve, nat. size. Upper Silurian; Wisby. *a*, side view; *b*, ventral outline.
- Fig. 12. *Isochilina punctata* (d'Eichw.), outline of the inside of a hollow cast of the fore part of a left valve, magnified 4 diam. Lower Silurian; Gatschina, near Saretsche, Russia.
- Fig. 13. *Leperditia balthica* (His.), var. *contracta*, nov., outline of a right valve, magnified 9 diam. Upper Silurian; Talkof, Livonia.
- Fig. 14. *Leperditia balthica* (His.), var. *contracta*, nov., outline of a partly imbedded right valve, with eye-spot and muscle-spot, magnified 23 diam. Upper Silurian; Kamenetz-Podolsk.
- Fig. 15. *Leperditia phaseolus* (His.), outline of a right valve, with eye-spot and muscle-spot, magnified 6 diam. Upper Silurian; Randifer, Oesel.
- Fig. 16. *Leperditia Hisingeri*, Schmidt, var., outline of a left valve, with eye-spot and muscle-spot, magnified 6 diam. Upper Silurian; Randifer, Oesel.
- Fig. 17. *Leperditia balthica* (His.), var. *contracta*, nov., left valve, with the shell broken in the middle, also imbedded below and behind.

PLATE XX.

- Fig. 1.* *Primitia simplex*, var. *Sanctojohannesiana*, nov., outline of a right valve, magnified 23 diam. Cambrian; St. John's, Newfoundland. *a*, side view; *b*, end view.
- Fig. 2.* *Primitia simplex*, var. *Lloydiana*, nov., outline of a complete carapace, magnified 23 diam. Cambrian; St. John's, Newfoundland. *a*, side view, left valve shown; *b*, end view; *c*, edge view.
- Fig. 3.* *Primitia simplex*, var. *Milneana*, nov., right valve, magnified 23 diam. Cambrian; St. John's, Newfoundland.
- Fig. 4.* *Leperditia fabulites* (Conrad), outline of a left valve, broken on the ventral margin, magnified 4 diam. Lower Silurian (?); Neile Bay.
- Fig. 5.* *Leperditia canadensis*, Jones, left valve, broken, and showing another valve squeezed within it symmetrically, magnified 4 diam. Lower Silurian (?); Neile Bay.
- Fig. 6.* *Leperditia Hicksii*, Jones, imperfect carapace, right valve shown, broken behind, magnified 4 diam. Menevian; St. David's, South Wales. *a*, side view; *b*, ventral outline of one valve.
- Fig. 7.* *Leperditia fabulites* (Conrad), var. *josephiana*, Jones, right valve, in outline. Lower Silurian; St. Joseph's Island, Canada. *a*, nat. size; *b*, magn. 2 diam.
- Fig. 8.* *Leperditia fabulites* (Conrad), var. *josephiana*, Jones, perfect carapace, in outline, with left valve outwards, magnified 4 diam. Lower Silurian; Lebanon, Tennessee, U. S. *a*, side view; *b*, hinder end; *c*, ventral edge.
- Fig. 9.* *Leperditia Billingsii*, nov., internal cast of a carapace, not quite perfect at the dorsal corners, magnified 4 diam. Lower Silurian; near Lake Winnipeg. *a*, side view [right (?) valve seen]; *b*, edge view.

XXXIV.—*Ctenoptychius* or *Kammplatten*.

By T. P. BARKAS, F.G.S.

To the Editors of the 'Annals.'

GENTLEMEN,

Your correspondent Mr. Thomas Stock, of the Museum of Science and Art, Edinburgh, in his communication in your issue of August 1881, pp. 90-95, refers at some length to our present knowledge of the teeth of *Ctenoptychius*, and appears disposed to accept the theory of Professor Fritsch, that those specimens which I have named *Ctenoptychius unilateralis* are "Kammplatten" or "Kammleisten," belonging to *Ophiderpeton*, and associated with the anal orifice of that Coal-measure Labyrinthodont.

The genus *Ophiderpeton* was established by Prof. Huxley on tolerably complete specimens obtained from Jarrow Colliery, Kilkenny, Ireland. The specimens were a few years ago in the natural-history work-rooms of the British Museum, and are now, I suppose, removed to the Kensington British-Museum Department. The matrices in which the